

Notice of Allowability

Application No.

09/938,277

Examiner

Zia R. Hashmi

Applicant(s)

HUGHEY ET AL.

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 8/15/03.
2. ☒ The allowed claim(s) is/are 1-44.
3. ☒ The drawings filed on 14 August 2002 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- * Certified copies not received: _____.
5. ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 - (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
8. ☐ CORRECTED DRAWINGS must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No. _____.
 - (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
 - (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet.

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|---|
| 1 <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 2 <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3 <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 4 <input type="checkbox"/> Interview Summary (PTO-413), Paper No. _____ |
| 5 <input type="checkbox"/> Information Disclosure Statements (PTO-1449), Paper No. _____ | 6 <input type="checkbox"/> Examiner's Amendment/Comment |
| 7 <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | 8 <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9 <input type="checkbox"/> Other |

DETAILED ACTION

Allowable Subject Matter

1. In response to Office Action of February 13, 2002, an "Amendment" was received on August 15, 2002. Claim 29 has been amended, as indicated.

2. Claims 1-44 are allowed.

3. The following is an examiner's statement of reasons for allowance:

With respect to the independent claims 1, 14, 21, 27, 33, 36, and 40, prior art fails to disclose a method of converting a non-gaseous sample by nebulizing or injecting a sample directly into a converter, for accelerator mass spectrometry (AMS) analysis comprising converting desired element present in the non-gaseous sample to a predetermined gaseous form, and transporting it to an AMS ion source. The prior art also fails to disclose an interface comprising of two stages, which separates an analyte from carrier material in the non-gaseous sample and the second stage converting the separated sample stream to predetermined gaseous form.

In the prior art of chromatography, where a liquid or gas chromatograph is coupled directly to an ion source system of an AMS analyzer, there are no provisions for desolvation of an analyte from the accompanying matrix material, resulting in lesser detection limits in detection and measurements of carbon-14 or hydrogen-3, which are very important ingredients of biological samples of interest. This is because of the fact that molecular dissociation and ion formation (positive or negative) occur in the same

process, resulting in a significant dependence of conversion efficiency on output chemical form. Techniques developed for separating analytes from matrix material, like "moving wire" or universal interface (UI) have either low analyte transfer efficiency or are not scalable to lower liquid flow rates (< 1 ul/minute), required for the analysis of extremely small samples.

According one aspect of the present invention, an interface introduces a solid or liquid sample into an AMS system, in a non-gaseous form into a converter stage, with provisions for separating the analyte molecules from accompanying matrix material. The converter is then allowed to convert the labeled molecules of the sample to one or more standard molecular forms (CO_2 , H_2 , etc.) for introduction into the AMS ion chamber. In another embodiment of the present invention, a sample is nebulized using electrospray and desired elements in the sample are converted to a predetermined gaseous form, and transported to an AMS for analysis. In another embodiment, a sample is deposited onto a solid substrate, and desired elements of the sample are converted to a predetermined gaseous form, which is then provided to an analytical device for further analysis, or the substrate can be directly introduced into an AMS ion source. The ion source converts the desired elements present in the analyte into ionic species suitable for extraction and injecting into an AMS system.

Claims 2-13, 15-20, 22-26, 34-35, and 37-39 are allowed by virtue of their dependencies on the independent claims 1, 14, 21, 27, 33, 36, and 40.

Conclusion

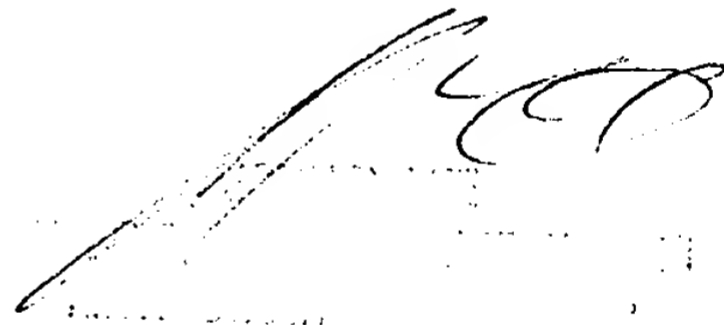
4. Meyer discloses (6,455,844) a method for performing AMS, which includes producing multiply charged ions for single-atom detection of isotopes.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zia Hashmi whose telephone number is (703) 305-0419.

The examiner can normally be reached between 8.30 AM- 5 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (703) 308-4116.

Zia Hashmi

November 26, 2003.

A handwritten signature in black ink, appearing to read 'Zia Hashmi', is written over a faint, dotted rectangular box. The signature is stylized with a large, sweeping initial 'Z'.